3.5 More Problem Solving

Given Standard form of an equation, what do you when....

...you are asked to find when an object lands,break even point...
(ie find the roots/zeroes/x int,solve).

Two methods:

1. Quadratic formula (works every time)
2. Factor and set factors to zero

...you are asked to find the Max/Min and when it occurs

Two methods:

1. Complete the square to vertex form
2. Factor, find zeroes, find x half way between zeroes, sub back in for y

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Mind Map...

Recall: What we know when given equations in various forms

What can you tell from standard form?

$f(x) = ax^2 + bx + c$

- direction of opening and stretch a
- the y intercept c

Complete the square

Expand

Factor or Quad Formula

Expand

Find x of vertex half way between zeros sub in find y

Isolate x using Backwards Bedmas

What can you tell from Vertex form?

$f(x) = a(x-h)^2 + k$

- direction of opening and stretch a
- the vertex (h,k)
- max/min & when it occurs

Can find:

- the zeros (set = to 0 and solve for x using backward BEDMAS)
- y-intercept f(0)

What can you tell from Factored form?

$f(x)= a (x - r) (x - s)$

- direction of opening and stretch a
- the zeros r and s

Can find:

- vertex (half way between the zeros
- y-intercept f(0)

Mar 28-8:52 AM

Ex.1 The height of an object thrown off a tower is given by $h = -5t^2 + 35t + 90$, where h is the height above the ground in metres and t is the time in seconds.

What order will you do these questions in?

What method(s) will you use?

In your groups, try and answer these questions using different orders and methods

#2 When does the max height of the object occur?

What is the max height of the object?

#1 What is the initial height of the object?

#3 How long does it take for the object to hit the ground?

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Ex.1 The height of an object thrown off a tower is given by $h = -5t^2 + 35t + 90$, where h is the height above the ground in metres and t is the time in seconds.

1) What is the initial height of the object? 90 m

2) When does the max height of the object occur and what is the max height of the object?

$= -5t^2 + 35t + 90$

$= -5(t^2 - 7t) + 90$

$= -5[t^2 - 7t + 12.25 - 12.25] + 90$

$= -5[(t-3.5)^2 - 12.25] + 90$

$= -5(t-3.5)^2 + 61.25 + 90$

$= -5(t-3.5)^2 + 151.25$

∴ the max height occurs at 3.5 s and the max height is 151.25 m

Vertex (3.5, 151.25)

3) How long does it take for the object to hit the ground?

$0 = -5(t-3.5)^2 + 151.25$

$\frac{-151.25}{-5} = \frac{-5(t-3.5)^2}{-5}$

$\sqrt{30.25} = \sqrt{(t-3.5)^2}$

$\pm 5.5 = t - 3.5$

$3.5 \pm 5.5 = t$

$t = -2$ or $t = 9$

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Ex 2

The height of the football kicked from the ground is given by the function $h(t) = -5t^2 + 20t$ where $h(t)$ is the height in meters and t is the time in seconds.

$= -5t(t - 4)$

Which do I answer first?

For how long is the ball at or above 7m ?

What is the maximum height?

When will the football reach its maximum height?

State the domain and range as it applies to the situation.

Oct 17-11:15 AM

Ex 2

The height of the football kicked from the ground is given by the function $h(t) = -5t^2 + 20t$ where $h(t)$ is the height in meters and t is the time in seconds.

1) When will the football reach its maximum height?

$= -5t^2 + 20t$
$= -5(t^2 - 4t)$
$= -5(t^2 - 4t + 4 - 4)$
$= -5[(t-2)^2 - 4]$
$= -5(t-2)^2 + 20$

∴ the football will reach its max height at 2sec

2) What is the maximum height?

∴ the max height is 20m.

3) State the domain and range as it applies to the situation.

$= -5t(t - 4)$ $\{t \mid 0 \le t \le 4, t \in R\}$

2) For how long is the ball at or above 7m ? $\{y \mid 0 \le y \le 20, y \in R\}$

$7 = -5t^2 + 20t$

$0 = -5t^2 + 20t - 7$ (a, b, c)

$= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-20 \pm \sqrt{20^2 - 4(-5)(-7)}}{2(-5)}$

$= \frac{-20 \pm \sqrt{260}}{-10}$

$= 0.387$ OR 3.61

$= 3.61 - 0.387$

$= 3.22$

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Ex 3

The Golden Gate Bridge, in San Francisco is a suspension bridge supported by a pair of cables that appear to form parabolas. The cables are attached at either end to a pair of towers at points 152 m above the roadway.

The towers are 1280 m apart, and the cable reaches its lowest point when it is 4 m above the roadway.

a) Determine an algebraic expression that models the cable as it hangs between the towers.

b) What is the height of the cable 100 m from its lowest point?

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Practice

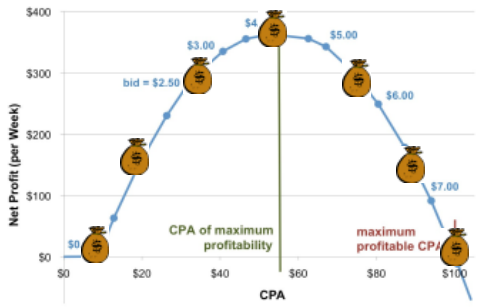
Complete other metho
for example 3

p 162 # 8, 10, 12, 13

p142 # 17

p 169 #9-12

3.5 Handout



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